Solving Triangles

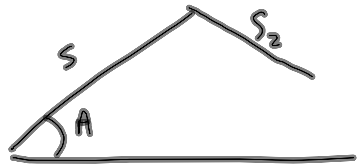
Basic Forms of Given Information (minimum of 3 parts)

~~AAA~~

AAS $\cong$ SSS

ASA SAS

SSA? → SsA



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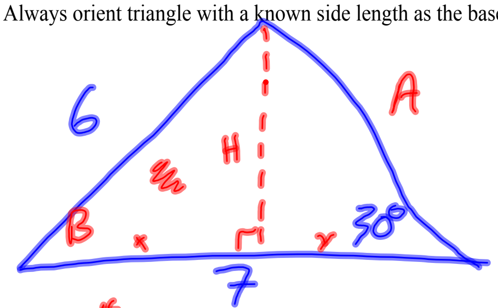
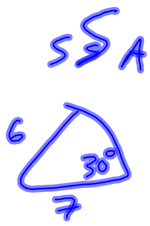
- Always orient triangle with a known side length as the base.



SsA



$\sin B = \frac{H}{6}$

Write 2 equations:
- One expressing the height of the triangle two ways.
- One expressing the base of the triangle two ways.

$H = 6 \sin B = A \sin 30°$

$6 \cos B + A \cos 30° = 7$

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Then use a CAS to solve.

==> Restrict angles to reasonable values to avoid solver complications

NO INDICATION THAT Δ IS AMBIGUOUS, BUT CAS FINDS BOTH ANYWAY.

WolframAlpha computational.. knowledge engine

6sin(b)=a*sin(30 deg) and 6cos(b)+a*cos(30 deg)=7 and 0<b<180 deg

Input: Mathematica form

$6 \sin(b) = a \sin(30°) \wedge 6 \cos(b) + a \cos(30°) = 7 \wedge 0 < b < 180°$

Alternate forms:

$a = 12 \sin(b) \bigwedge \sqrt{3}\, a + 12 \cos(b) = 14 \bigwedge 0 < b < \pi$

$a \sin(30°) = 6 \sin(b) \wedge 6 \cos(b) + a \cos(30°) = 7 \wedge 0 < b < 180°$

$6 \sin(b) = \frac{a}{2} \bigwedge \frac{1}{2}(\sqrt{3}\, a + 12 \cos(b)) = 7 \bigwedge 0 < b < \pi$

Alternate form assuming a and b are positive:

$a = 12 \sin(b) \bigwedge \sqrt{3}\, a + 12 \cos(b) = 14 \bigwedge b < \pi$

Solutions: Exact forms | More digits

$a \approx 1.18878, \quad b \approx 0.0992278$

$a \approx 10.9356, \quad b \approx 1.99517$

BOTH ANSWERS!!!

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BUT b is in radians — a minor inconv.

Notice that all cases can be solved this way. If this is an ambiguous case, both solutions are returned simultaneously. If there is no solution, this too is picked up. ONE SIZE FITS ALL!

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